

WE CLAIM:

1. A composite structural material comprising a fiber dispersed in a fused
5 matrix, the composite comprising:

nylon fiber having a length of about 0.9 cm to 8 cm and a diameter of about 0.2 mm to 7 cm, dispersed in a fused matrix, the fused matrix comprising a thermoplastic comprising a nylon and a polyolefin;

wherein said composite structural material has a flexural elastic modulus
10 (ASTM D790) of at least about $2 \cdot 10^5$ psi.

2. The composite material of claim 1, wherein said matrix comprises about 20 to 30 wt.-% Nylon and about 1 to 40 wt.-% of a polypropylene.

15 3. The composite material of claim 1, wherein said matrix comprises about 0.1 to 30 wt.-% Nylon 6 and about 1 to 40 wt.-% of a polypropylene.

4. The composite material of claim 1, wherein said matrix comprises about 0.1 to 30 % Nylon 6,6 and about 1 to 40 wt.-% of a polypropylene.
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5. The composite material of claim 1, wherein said matrix comprises a blend of a virgin thermoplastic and thermoplastic derived from a carpet and the fiber has a diameter of about 0.2 mm to 1 cm.

25 6. The composite material of claim 1, wherein said matrix comprises a blend of a virgin thermoplastic and a blend of two or more carpet sources.

7. The composite material of claim 1, wherein said composite comprises about 25 to 35 wt.-% Nylon and about 1 to 40 wt.-% of a polypropylene.
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8. The composite material of claim 1, wherein said composite comprises about 0.1 to 35 wt.-% Nylon 6 and about 1 to 40 wt.-% of a polypropylene.

9. The composite material of claim 1, wherein said composite comprises
5 about 0.1 to 35 % Nylon 6,6 and about 1 to 40 wt.-% of a polypropylene.

10. The composite material of claim 1, wherein said carpet comprises about 1 to 35 wt.-% Nylon 6, about 0.1 to 35 wt.-% Nylon 6,6 and about 25 to 35 wt.-% polyolefin.

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11. The composite material of claim 1, wherein said carpet comprises about 20 to 40 wt.-% Nylon 6, about 20 to 40 wt.-% Nylon 6,6 and about 20 to 40 wt.-% polyolefin.

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12. The composite material of claim 1, wherein said composite material has a flexural elastic modulus (ASTM D790) of at least about $2 \cdot 10^5$ psi.

13. The composite material of claim 1, wherein said composite material has a tensile strength (ASTM D638) of at least about $2 \cdot 10^3$ psi.

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14. The composite material of claim 1, wherein said composite material has a tensile strength (ASTM D638) of at least about $2.5 \cdot 10^3$ psi.

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15. The composite material of claim 1, wherein said composite material has a compressive strength (ASTM D695) of at least about $6 \cdot 10^3$ psi.

16. The composite material of claim 1, wherein said composite material has a compressive strength (ASTM D695) of at least about $6.5 \cdot 10^3$ psi.

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17. The composite material of claim 1, wherein said composite material has a water absorption of less than about 3% by weight gain of water over a 24 hour period.

18. The composite material of claim 1, further comprising at least one dye.

19. A sheet formed from the composite material of claim 1 having a
5 thickness of about 0.1 centimeter to about 2 centimeters.

20. A sheet formed from the composite material of claim 1 having a width of
about 2 centimeters to about 200 centimeters.

10 21. A composite structural material comprising a fiber dispersed in a fused
matrix, the composite comprising:
fiber having a diameter of about 0.2 mm to 7 cm, derived from carpet, carpet
recycle, carpet scrap or mixtures thereof, dispersed in a fused matrix, the fused matrix
comprising a thermoplastic comprising nylon, polyolefin or mixtures thereof;
15 wherein said composite structural material has a flexural elastic modulus
(ASTM D790) of at least about $2 \cdot 10^5$ psi.

22. The composite material of claim 21, wherein said matrix comprises
about 20 to 30 wt.-% Nylon.

20 23. The composite material of claim 21, wherein said matrix comprises
about 0.1 to 30 wt.-% Nylon 6.

24. The composite material of claim 21, wherein said matrix comprises
25 about 0.1 to 30 % Nylon 6,6.

25. The composite material of claim 21, wherein said matrix comprises
thermoplastic derived from carpet and the fiber has a diameter of about about 0.2 mm to
1 cm.

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26. The composite material of claim 21, wherein said matrix comprises a blend of a thermoplastic and thermoplastic derived from a carpet.

27. The composite material of claim 21, wherein said matrix comprises a
5 blend of a thermoplastic and a blend of two or more carpet sources.

28. The composite material of claim 21, wherein said composite comprises about 25 to 35 wt.-% Nylon.

10 29. The composite material of claim 21, wherein said composite comprises about 0.1 to 35 wt.-% Nylon 6.

30. The composite material of claim 21, wherein said composite comprises about 0.1 to 35 % Nylon 6,6.

15 31. The composite material of claim 21, wherein said composite comprises about 25 to 35 wt.-% of a polymer selected from Nylon 6, Nylon 6,6 or mixtures thereof and about 35 wt.-% polyolefin by weight.

20 32. The composite material of claim 21, wherein said carpet comprises about 0 to 35 wt.-% Nylon 6, about 0.1 to 35 wt.-% Nylon 6,6 and about 25 to 35 wt.-% polyolefin by weight.

25 33. The composite material of claim 21, wherein said carpet comprises about 20 to 40 wt.-% Nylon 6, about 20 to 40 wt.-% Nylon 6,6 and about 20 to 40 wt.-% polypropylene by weight.

34. The composite material of claim 21, wherein said composite material has a flexural elastic modulus (ASTM D790) of at least about $2 \cdot 10^5$ psi.

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35. The composite material of claim 21, wherein said composite material has a tensile strength (ASTM D638) of at least about $2 \cdot 10^3$ psi.

36. The composite material of claim 21, wherein said composite material has
5 a tensile strength (ASTM D638) of at least about $2.5 \cdot 10^3$ psi.

37. The composite material of claim 21, wherein said composite material has a compressive strength (ASTM D695) of at least about $6 \cdot 10^3$ psi.

10 38. The composite material of claim 21, wherein said composite material has a compressive strength (ASTM D695) of at least about $6.5 \cdot 10^3$ psi.

39. The composite material of claim 21, wherein said composite material has a water absorption of less than about 3% by weight gain of water over a 24 hour period.

15 40. The composite material of claim 21, further comprising at least one dye.

41. A sheet formed from the composite material of claim 21 having a thickness of about 0.1 centimeter to about 2 centimeters.

20 42. A sheet formed from the composite material of claim 21 having a width of about 2 centimeters to about 200 centimeters.

43. A composite structural material of claim 21 comprising a fiber dispersed
25 in a fused matrix, wherein the material is formed by introducing a carpet feed stock into an extruder, and extruding the carpet feed stock to form a structural composite member.

44. The composite material of claim 43, wherein the fiber is formed from a higher melting point component of the carpet feed stock, and the fused matrix is formed
30 from a lower melting point component of the feed stock.

45. A method of manufacturing a rigid board composite structural material comprising the steps of:

- (a) comminuting carpet to a particle size less than about 3 centimeters to form a carpet feed stock comprising fiber of claim 21, said fiber having a diameter of about 0.2 mm to 1 cm;
- 5 (b) adjusting the carpet feed stock to such that the content of the feed stock is about 25 to 35 wt% nylon forming a balanced carpet feed stock;
- (c) introducing the balanced carpet feed stock into an extruder having at least one barrel zone temperature greater than about 250°C; and
- 10 (d) extruding the carpet feed stock to form a structural composite comprising fiber dispersed in a fused matrix, the composite having a thickness of about 0.1 to 2 centimeters, a width of about 2 to 200 centimeters and an indeterminate length.

15 46. The method of claim 45, wherein said carpet comprises carpet ends, carpet recycle, carpet scrap or mixtures thereof.

47. The method of claim 45, wherein said extruder has at least one barrel zone temperature greater than about 250° C.

20 48. The method of claim 45, wherein said extruder has at least one barrel zone temperature greater than about 300° C.

49. The method of claim 45, wherein said feed stock is extruded at pressures above about $1.5 \cdot 10^3$ psi.

50. The method of claim 45, wherein said carpet feed stock is extruded at pressures above about $2 \cdot 10^3$ psi.

25 51. The method of claim 45, wherein said composite material is extruded to a thickness of from about 0.1 to 2 centimeters.

52. The method of claim 45, wherein the composite feed stock additionally comprises a pellet or flake thermoplastic resin.

53. The method of claim 45, wherein the length of the composite is less than about 10 meters.

5 54. A composite structural material comprising a fiber dispersed in a fused matrix, wherein said composite structural material has a flexural elastic modulus (ASTM D790) of at least about $2 \cdot 10^5$ psi.

10 55. The composite of claim 54, wherein the composite comprises a blend of a polyolefin, a polyamide, and a hot-melted heat adhesive.

56. The composite material of claim 54, wherein said matrix comprises about 20 to 30 wt.-% Nylon.

15 57. The composite material of claim 54, wherein said matrix comprises about 0.1 to 30 wt.-% Nylon 6.

58. The composite material of claim 54, wherein said matrix comprises about 0.1 to 30 wt% Nylon 6,6.

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